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B3B

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(54) Improvements relating to feed fingers

(57) A bar-stock feed finger device comprises a tubular body 1 externally screw-threaded to receive an adjustable cap part 7 which is screwed on to the body to adjust the diameter of gripping means disposed within the body and is lockable in an adjusted position via a threaded ring 10. Various described gripping means in the form of a confronting spring loaded frusto-conical elements (shown) or axially slit resiliently compressible sleeves are interchangably accommodated by the tubular body.

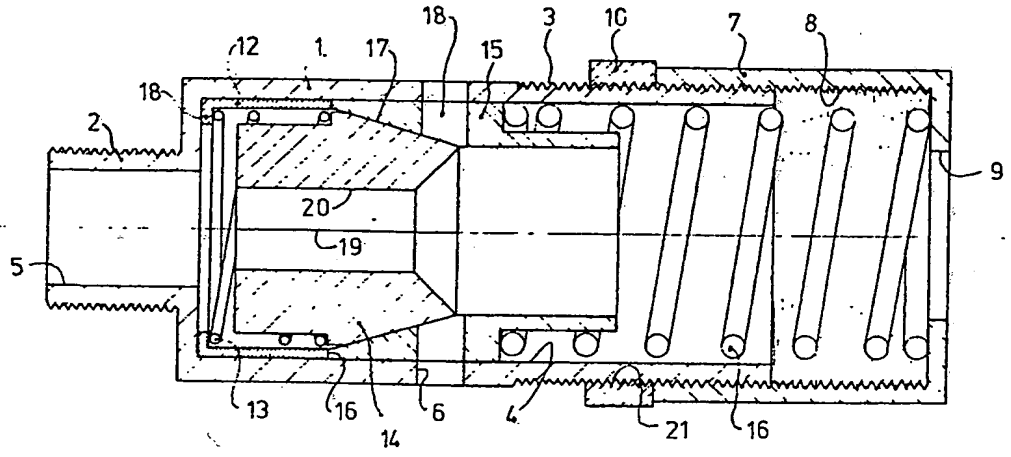

Fig.1

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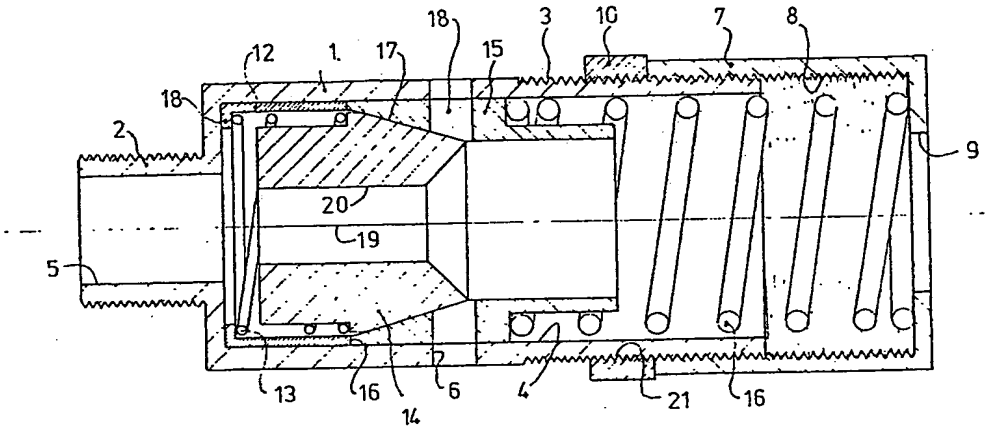

Fig.1

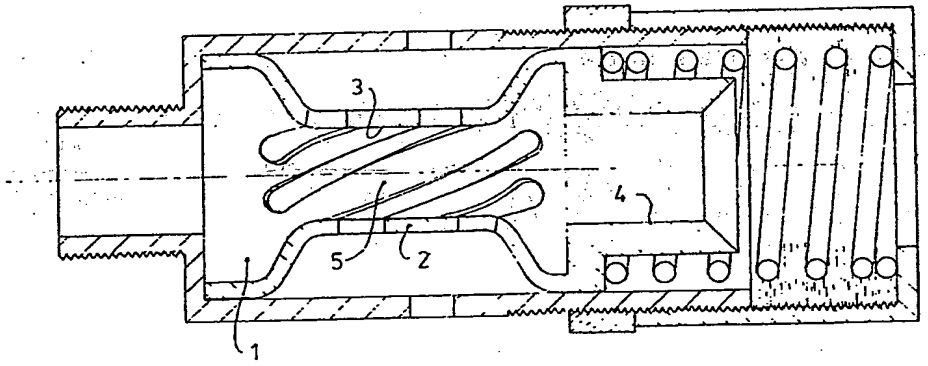

Fig. 2

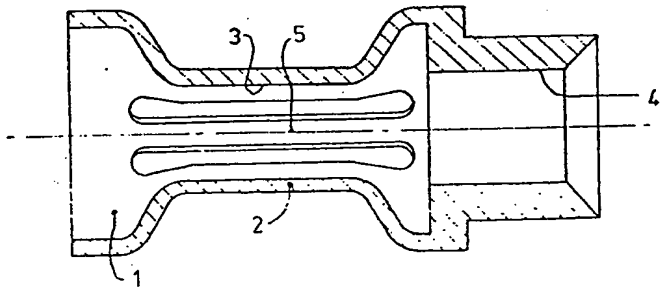

Fig.3

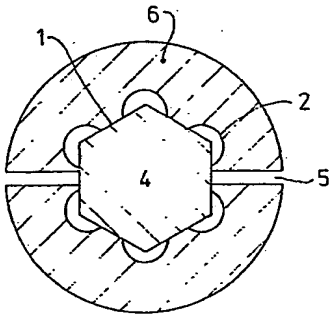

Fig. 4

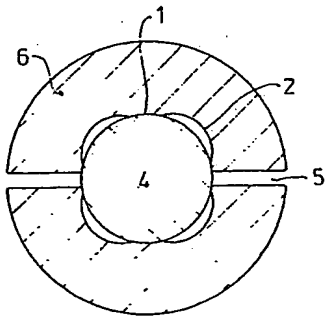

Fig. 5

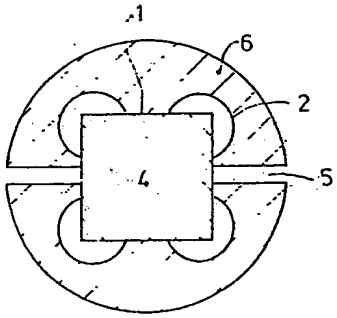

Fig. 6

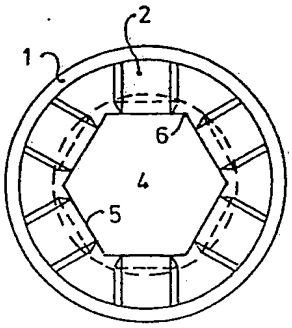

Fig. 7

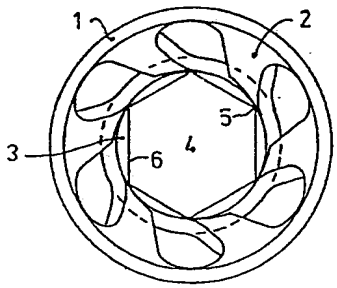

Fig. 8

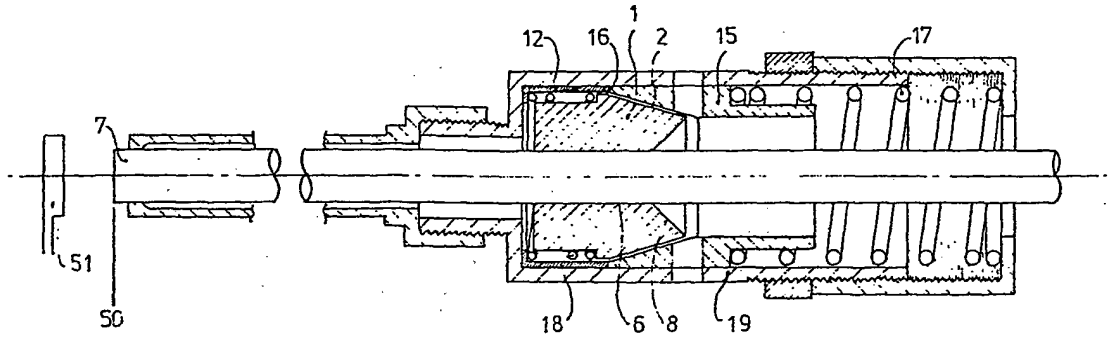

Fig. 9

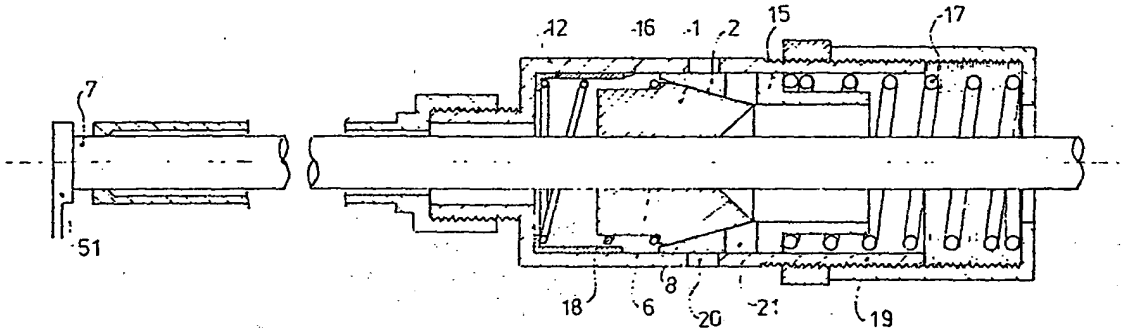

Fig. 10

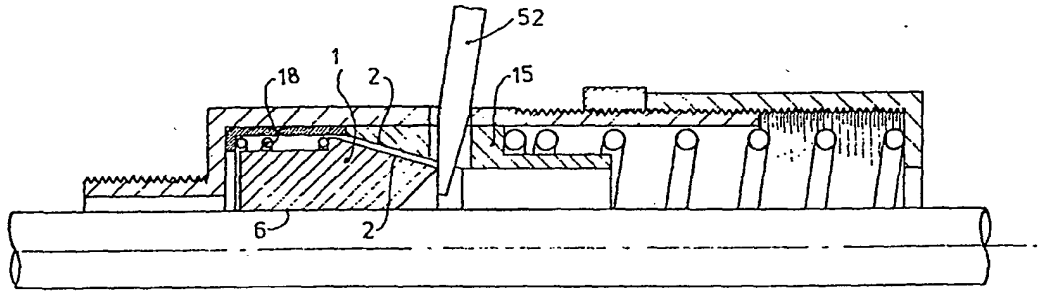

Fig. 11

SPECIFICATION

Improvements relating to feed fingers

I, Peter Leslie Windley, a British Subject trading as P & C Machine Tool Services, of Quinton, Birmingham, England to hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed to be particularly described in and by the following statement:

This invention relates to improved feed devices of the kind commonly used for advancing bar stock in multi-spindle or single spindle automatic lathes or like machines.

Conventional feed devices are made from a steel tube, have a plurality of parallel slots extending along the tube from one end. The diameter is reduced at that end by closing the slots. Whilst reduced in diameter the tube is heat treated to maintain the reduced diameter. In operation the material is ged through the open large diameter end and forced into the closed diameter end, this provides a friction grip to feed the material by means of a reciprocating motion through a collet to an end stop to provide a predetermined portion of material on which the work is done. A function of the device is to ensure the portion of material on which work in done is within the length tolerance. In certain circumstances the surface of the material must be free of scores or marks. Master Feed devices of similar construction have separate segmented metal grippers.

An alternative commonly used feed device comprises a tubular body, a plurality of radially spaced slots in the body, spring means located in the said slots and fixed at one end. The middle portion of the spring means is bowed radially inwardly of the body for engagement with material, adjustment of spring means by varying the bowing on to the material.

In operation the traditional feed devices have various disadvantages as follows: The grip cannot be adjusted to account for wear or various weights and section of the material, only one size and section of material can be used, the feed device is restricted to one machine, too much tension will result in the surface of the material being scratched with straight scores, or spiral scores if high rotational speeds are involved; too little tension will allow slip and result in a short work portion, this caused wastage of material and affects the life of the feed device. Too much tension will also make the engagement of relatively small section material difficult and in some cases impossible without additional heat treatment to relax the tension. At maximum machine capacity the feeder is weakest and has difficulty holding feedout length, and requires frequent replacement.

The disadvantages of other devices are as follows: When relatively small section material is used the distance between the tubular body and the material surface is increased, the rotational forces acting on spring means will flex or rock the spring means to to cause straight or spiral marks on the material surface. The width of spring means will determined the total surface area available for gripping the material.

The present invention relates to improved feed devices which avoids or substantially reduces the disadvantages of prior art feed devices.

Firstly a holder suitable to accept both feed devices will be described followed by a description of each feed device in a configuration assisting the conventional method of feeding.

The invention accordingly provides a holder suitable for accepting the feed devices as follows: A cylindrical body, having a parallel bore extending from one end and closed at the other end, a reduced diameter extends outwards from the closed end, and a thread is formed on its outside diameter, a bore passes through the closed end and the extended portion, an external thread on the opposite end, a plurality of radially drilled holes in the larger diameter. A larger diameter cylinder has an internal bore extending from one end closed at the other, a tapered bore of small diameter through the closed end an internal thread corresponding to that on the cylindrical body, a ring with the outside diameter the same as that of the cylinder and an internal corresponding to that on the cylindrical body.

The invention accordingly provides a feed device to fit into the above described holding device and suitable for use in feeding metal or composite elongated material to automatic lathes or like machines, which comprises a cylindrical insert having an external conical taper on one end, a reduced diameter at the opposite end, a profiled bore and a tapered counter bore at the external conical taper end, a plurality of radially spaced longitudinal slots divide the insert into segments. A cylindrical cup having a parallel bore extending from one end to leave a thickness of material at the other end, a reduced bore through this thickness forms an internal lip. A cylindrical taper seat having a conical taper bore, corresponding with that on the cylindrical insert at one end and a reduced external diameter at the other end, a parallel bore extending from the reduced external diameter end and at this same end a tapered counter bore, and a plurality of radially drilled holes. A light spring means located in the cylindrical cup and around the reduced portion of the cylindrical insert, a strong spring means located around and extending from the reduced external diameter on the cylinderical taper seat.

The invention accordingly provides an alter-

native feed device to fit into the above described holding device and suitable for use in feeding metal or composite elongated material to automatic lathes or like machines which comprise a tubular insert having a reduced diameter extending from one end, a bore through this reduced diameter and a tapered counter bore in the outside face of this end. A plurality of radially spaced longitudinal slots parallel or spiral in large diameter portion. Spring members between the slots are deflected radially inwardly to grip the material when positioned in the tubular member.

Embodiments of the Feed Device according to the present invention are now described with reference to the accompanying drawings in which:

Figure 1 is a section along the longitudinal axis according to the first and second embodiment.

Figure 2 is a section along the longitudinal axis according to the first and third embodiment.

Figure 3 is a section along the longitudinal axis according to the third embodiment.

Figures 4, 5 & 6 are cross sections of the second embodiment showing the types of bore profiles for various bar stock sections.

Figure 7 is a cross section of the third embodiment showing the arrangement of the straight spring members deflected inwards.

Figure 8 is an end view of the third embodiment showing the spiral spring members deflected inward to grip hexagon material across the corners.

Figure 9 & 10 show in diagramatical form respectively two positions in the normal cycle of operation of a typical lathe incorporating the device on to modified standard feed tube and feed finger.

Figure 11 shows the method of releasing the taper lock when reverse movement of the material is necessary.

Referring to Fig. 1 the holder comprises, the Adapter (1) having an external thread (2) for attachment to the machine feed tube (not shown), an external thread (3), a large bore (4), to accept the feed devices and a small bore (5) through which the material freely passes, radially spaced holes (6) are positioned to provide access for lock release tool (not shown), a Screw Cap (7) with an internal thread (8) to correspond to thread (3), a bore (9) through the end and tapered to provide a lead in for material, a lock ring (10), with an internal thread (21) to correspond with (3) and (8) and which locks the assembly together.

A Spring Cup (12) contains the pad spring (13) and forms a stop at (16) against which the taper seat (15) rests. The Taper Seat (15) has radial holes (18) and by internal rotation the taper seat (15) within the adaptor (1) the holes can be aligned providing access for lock release lever (not shown). An Overfeed spring (16) is located around Taper Seat (15) and when compressed by the Screw Cap (7) forces the Taper Seat (15) against the stop (16) and the Spring Cup (12) against the internal face (18) of adaptor (1). A Pad Spring (13) is contained within the Spring Cup (12). The Taper Pads (14) are located in the Taper Seat (15) and lightly held on the Taper (17) by Pad Spring (13). Spring Cup (12) and Taper Seat (15) are free to rotate within the bore of Adaptor (1).

Figures 4, 5 & 6 show various types of bore profile (2) to both avoid marking the surface of different sections of material, the contact points (1) can be faced with hard metal, composite or synthetic material to increase life or performance. The gap (5) shows the Taper Pads (6) in the open position gripping the material (4). The closed position is shown in Fig. 1.

Referring to Figs. 2 and 3 the Spring Gripper (1) is an alternaitve feed device which can be contained in the same holder Fig. 1 and using the same Spring (16). The Spring Members (2) are deformed inwards to form a bore (3) slightly smaller than the material (not shown) the material is forced through the bore (3) and the material is gripped by Spring Members (2). The Bore (4) is slightly larger than material diameter and centrally supports the material to prevent excess angular deflection. The Spiral Spring Members Fig. 2 (5) will grip the diameter material more efficiently because the wrap around form, there are no longitudinal edges and in effect, present a cylindrical but flexible gripping bore to the surface of the material. Referring to Fig. 8 the circular profile (3) of Spring Members (2) show the wrap around grip. Hexagon material is also shown being gripped by the bore on its corners (5) the flats (6) passing through the bore (3) completely free from scoring. Square and other regular section material (not shown) can also be accomodated in a similar manner.

Figure 7 shows the method of gripping the hexagon material (4) on the flats (5) using longitudinal Spring Members (2) thus preventing damager to the corners (6). The gripping surface of the Spring Member (2). Fig. 7 and Fig. 8 can be faced with hard metal, composite or synthetic material to increase the life of performance. Relatively small diameter material can be accomodated by using small grippers held in reducing sets (not shown).

Reference is now made to the cycle operation illustrated in Figs. 9 & 10. The material (7) is fed into the feed device until it comes into contact with lead-in (8) in the position this Pad Spring (18) is forcing the Taper Pads (1) into the Taper (2) of Taper Seat (15) but unable to overcome the stronger overfeed spring (17). Further movement of the material (7) forces the Taper (2) of Pad (1) out of the Taper (2) on Taper Seat (15) to compress Pad Spring (18), the slots (19) Fig. 1 will open

and allow the material to pass into bore (6). The material is fed through with very slight frictional resistance to a position (50). At this point and in this condition a feed stroke takes place towards the machine stop (51).

Immediately this movement takes place, the friction of the pads (1) assisted by pressure of Pad Spring (18) pushes the Taper (2) of Pad (1) into the Taper (2) of Taper Seat (15). The wedge effect fromed by the contact between Taper (2) and the material (7) locks Pad (1) on the material (7). The force requred to feed the material (7) is not sufficient to overcome the overfeed spring (17), therefore the material is immediately feed out until the end of the material (7) comes into contact with the machine stop (51). The enxure that the end of the material (7) does not bounce back from the machine stop (51), due to its inertia, a further small movement of the feed device is made. The Pads and Taper Seat cannot move further due to the locking effect of the Taper (2).

Referring to Fig. 10 further movement of the device tales place and the force on the Taper (2) is increased to force the Taper Seat (15) away from the contact point (16) and Cup (12) against the overfeed Spring (17) and holding the end of material (7) firmly against the Machine Stop (51). The Machine carries out operation on the material feed out, this portion is then parted off and the feed device returns to carry out another feed stroke and the cycle is continually repeated. It is necessary at times to be able to feed the material in the opposite direction and a facility for achieving this is described as follows:

Referring to Fig. 11 this operation is carried out with the feed device in the position illustrated in Fig. 9, by rotating the Pads (1) and Taper Sear (15) within the Adaptor (19), the holes (20 & 21) are aligned, a suitable tool (52) is placed through the holes to engage the rear edge of the Taper Pads (1), using the Tool (52) as a lever pressure is applied to release the contact between Taper (2) of Pad (1) and Taper (2) of Taper Seat (15) against light pressure of Pad Spring (18) and bore (6) is opened to allow the material (7) to be pushed through the Pad (1) in reverse direction.

The above described devices can be used in the conventional feed finger position or otherwise used when contained within a suitable holder.

CLAIMS

1. A feed device suitable for use in feeding metal bar or like elongate article to an automatic machine tool which comprises a holder suitable for containing gripping device for use in feeding elongate material to an automatic lathe or like machine which comprises a tubular housing to be mounted on the feed element of the machine and providing an internal cylindrical surface with a fixed attachment at one end, an adjustable attachment the opposite end and means to lock aid adjustble attachment with said tubular housing.

2. A feed gripper suitable to be contained in Fig. 1 and for use in feeding elongate material to an automatic lathe or like machine, which comprises a segmented sleeve having a parallel bore capable of opending and closing and of receiving said elongate material within the bore with minimum friction and capable when closed of gripping said elongate material, having anexternal conical form, an outer tubular member having an internal conical form corresponding to that of the segmented sleeve and into which said segmented sleeve is received, the resulting interaction of which limits the movement of the segmented sleeve in one direction and frees movement of the segmented sleeve in the other direction.

3. A feed gripper suitable to be contained in Fig. 1 and for use in feeding elongate material to an automatic lathe or like machine, which comprises a tubular member, the middle portion having a plurality of radially spaced slots parallel with its central axis, the so formed adjacent members being deflected radially inwardly to grip the elongate material.

4. A feed device suitable to be contained in Fig. 1 and for use in feeding elongate material to an automatic lathe or like machine which comprises a tubular member, the middle portion having a plurality of radially spaced longitudinal spiral slots the so formed adjacent members being deflected radially inwardly to grip the elongate material.

5. A holder according to Claim 1 having an external adjusting screw and lock ring, herein described and as hown in Fig. 1.

6. A holder according to Claim 1 having a thread to facilitate conventional attachment to a feed tube.

7. A feed device according to Claim 2 having a spring means to apply pressure to segmented sleeve.

8. A feed device according to Claim 2 having a spring means to apply pressure to segmented sleeve.

8. A feed device according to Claim 2 having a spring means to apply pressure to assembly.

9. A feed device according to Claim 2 wherein radial holes providing a means for the lock release function.

10. A feed device according to Claim 2 having a bore Figs. 3 & 4 slightly larger than material diameter to form a support bush.

11. A feed device according to Claim 3 having a bore in the reduced diameter portion slightly larger than the material diameter to form a support bush.

12. A feed diameter according to the Claims 2 & 3, having means to facilitate the use of smaller size inserts herein described.

13. A feed device substantially as herein

described with reference to the accompanying drawing.

CLAIMS

Amendments to the claims have been filed, and have the following effect:–

Claims 1 to 13 above have been deleted or textually amended.

New or textually amended claims have been filed as follows:–

1. A Feed Device comprising three separate tubular parts which when assembled form a hollow tubular holder into which various types of Feed Gripper can be fitted, a separate sleeve with reduced dia and extended on one end having means of attaching to a reciprocating part of the machine tool, a plain middle portion in which are a series of radially drilled holes, an externally threaded portion at the other end, a separate sleeve internally threaded at one end, an internal flange at the other end, a separate sleeve internally threaded portion at the other end, a separate sleeve internally threaded at one end, an internal flange at the other end, a separate tubular ring internally threaded, the said tubular ring and said internally threaded sleeve when placed on said externally threaded sleeve form the complete assembly, the end face of said tubular ring contacting the end face of said externally threaded sleeve lock the assembled parts together.

2. A Feed Device as described in CLAIM 1. wherein the said threaded portions are repositioned the said diameters changed so the said parts can be assembled in a similar but different configuraton but able to contain the said various types of Feed Gripper.

3. A Feed Gripper according to CLAIM 1., comprising a sleeve with a parallel bore one end and a conical bore the other end, the smaller end of the conical bore meeting the paralled bore approximately midway, a reduced outside diameter the same end as the parallel bore forms a recess and shoulder, radial holes midway along its length align with those described in CLAIM 1, a segmented gripper having an external cone in contact with the conical bore of the said sleeve, a parallel extension from the external cone is reduced to form a recess shoulder, a paralled bore providing selected points of contact with the material and giving clearance between the bore and material within the area of non contact, an internal conical bore at a small diameter end of the external cone forms a lead-in for material engaging the bore, a thin wall sleeve open one end and having an internal lip the other forms a recess and shoulder, a spring located in the recesses of the said thin wall sleeve and said segmented gripper applies light pressure to the shoulders to keep contact between the conical sections of the said segmented gripper and the said sleeve, also the bore of the said segmented gripper, in contact with the material, a spring located within the recess of the saif sleeve at one end and against the inner end face of the Feed Device at the other.

4. A Feed Gripper according to CLAIM 3. wherein said gripper assembly if free to rotate within the Free Device, being driven by the rotating material and thus preventing any rotary movement between the segmented gripper and the material and therefore preventing the scoring of the surface of the material.

5. A Feed Gripper according to CLAIMS 3 and 4 wherein said segmented gripper is moved against the light spring pressure and out of the conical bore of the said sleeve by the engagement of the material into the bore of the segmented gripper. Movement of the Feed Device against the weight of material and assisted by light spring pressure against the shoulder of the segmented gripper will drive the conical sections together and wedge the segmented gripper between the conical seection and material thus positively feeding the material in the required direction without slipping.

6. A Feed Gripper according to CLAIMS 3 to 5, wherein said spring, located within the recess of the sleeve and against the shoulder applies strong pressure to maintain, or return the conical end face of the said sleeve against the end face of the said thin wall sleeve when the feed stroke has been completed.

7. A Feed Gripper according to CLAIMS 3 to 6 wherein said segmented gripper has an internal cone, to provide a lead-in for material engagement in the bore, the configuration of said bore providing selected points of contact, and areas of non contact, along the bore depending on the section of material, and positioned to give maximum grip on material by a combination of the direct force applied by the wedging effect of said conical surfaces and the indirect wedging effect or bore wrapping around the surface of the material.

9. A Feed Gripper according to CLAIMS 3 to 7 wherein said segmented gripper is disengaged from the wedging effect of said conical surfaces by means of a tool placed through the said radial holes and by leverage on the conical end of the said segmented gripper release the locking effect and allow the material within the bore to be moved in the opposit direction to the normal feed.

9. A Feed Gripper according to CLAIMS 3 to 8 wherein the said segmented gripper has spiral slots between the segments to allow the gripping of hexagon or irregular section material on the corners.

10. A Feed Gripper according to CLAIM 3 to 9 wherein the said segmented gripper has semi circular or other shaped slots running along the surface of the bore and radially spaced to provide selected contact points on irregular shaped material.

11. A Feed Gripper according to CLAIMS

3 to 10 wherein the said segmented gripper has a means by which all segments are retained loosly or secured equidistant in the tubular form when removed from the assembly.

12. A Feed Gripper according to CLAIMS 3 to 11 wherein the said segmented gripper has the area of the bore in contact with the material coated with ceramics or synthetic material.

13. A Feed Gripper as described in CLAIMS 1. comprising a tube having a plurarity of radially spaced slots extending along its length but retaining a small portion of the tube at each end, the so formed adjacent and resiliant members, joined at each end, the so formed adjacent and resilient members, joined at each end, are deflected radially inwards to grip the selected section of material within its bore, a smaller diameter extended portion of tube forms an outer recess and shoulder providing means for axially locating or compressing the said tube to ensure the said deflected members are held in the selected postion, the bore of the said extended portion being slightly larger than the material to allow material to pass through without hinderance and prevent excessive angular deflections of the material gripped by the said resilient members when effected by high rotational forces.

14. A Feed Gripper as described in CLAIMS 1 and 13 wherein the said tube has spiral radially spaced slots along its length but retaining a small portion of the tube at each end, the so formed adjacent and resilient spiral member, joined at each end are deflected radially inwards to grip the selected section of material within its bore.

15. A Feed Gripper as described in CLAIM 1, 12, 13, and 14 wherein the said inward deflected resilient members, at the points of contact with the material are coated with ceramic or synthetic material.

16. A Feed Gripper as described in CLAIM 1, 12, 13, 14, and 15 wherein the means of locating compressing the said inward deflected resilient members is a resilient synthetic solid means located around or moulded to the outer suraces of the said inwardly deflected members, and fills the annulus formed by the said inwardly deflected members and the bore of the said Feed Device, but is not attatched to the bore of the said Feed Device.

17. A Feed Device substantially as herein described with reference to the accompanying drawings.

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